## DISCUSSION OF THE AMENDMENT

Applicants will cite to the paragraph number of the published patent application (PG Pub) of the present application, i.e., US 2006/0237124, when discussing the application description below and in the Remarks section, rather than to page and line of the specification as filed.

Claim 1 has been amended by making explicit what was at least implicit in steps (c) and (d), which amendment is supported by Fig. 1 and paragraph [0026]. In addition, "laminate" has been changed to --laminating-- for grammatical reasons.

New Claims 14 and 15 have been added. Claim 14 is supported by Examples 1 and 2 of the specification. Claim 15 is supported by Examples 3 and 4 of the specification.

Claim 8 has been amended to depend on new Claim 14. Claim 9 has been amended to recite that the resin is thermoplastic, as supported at paragraph [0030]. Claim 12 has been canceled.

No new matter is believed to have been added by the above amendment. Claims 1-11 and 13-15 are now pending in the application.

REMARKS

The rejections under 35 U.S.C. § 103(a) of:

Claims 1-3, 6 and 8-13 as unpatentable over US 6,416,856 (Crandall) in view of US 5,620,775 (LaPerre), US 5,514,441 (Pohto et al), US 6,416,188 (Shusta et al), and US 5,620,613 (Olsen);

Claims 4 and 7 as unpatentable over the above combination of references, and further in view of US 6,592,700 (Wang et al); and

Claim 5 over the above combination of references, including Wang et al, and further in view of "Applicant's admitted prior art",

are all respectfully traversed.

The various embodiments of the presently-claimed invention, as recited in independent Claims 1, 14 and 15, differ from the closest prior art, as discussed in further detail below, at least with regard to the pattern formed on the aluminum layer formed after carrying out step (d). In Claim 1, a non-etchable transfer pattern is printed onto the aluminum layer, thereby forming a transfer image and then the non-protected surface is demetallized. In Claim 14, the non-etchable transfer pattern is applied as a heat transfer printing film. In Claim 15, the aluminum layer is selectively exposed to a demetallizing solution using a screen printing machine.

In the present invention, after the glass beads are embedded in the carrier sheet, polyurethane resin is applied to the glass bead-containing web material, aluminum is deposited thereon which, as the result of carrying out steps (e) and (f) recited in Claim 1, or steps (e') and (f') in Claim 14, or step (e") in Claim 15, the aluminum necessarily is deposited on so-called "isles", i.e., where the beads have a metallized pattern thereon, and on the so-called "sea", i.e., where the beads have been demetallized [0024]. In addition,

aluminum is not deposited directly onto the glass beads but only on the polyurethane coating thereof.

As previously explained, for a pattern to appear on a retroreflective surface one of the following conditions must be realized:

A. An alternation of half metallized bead regions (high-visibility retroreflection, i.e., 300-500 cd/lx.$m^2$ or HVR zones) with bare fabric;

B. An alternation of half metallized bead regions (HVR zones), with transparent bead (latent retroreflection, i.e., 5-20 cd/lx.$m^2$ or LR zones) regions;

C. An alternation of half metallized bead regions (HVR zones) with regions in which beads are "coated/masked" in such a way that light propagation is avoided.

The present invention is drawn to a pattern formation according to caption B, containing metallized regions, i.e., isles, as discussed above, and transparent regions, i.e., sea, as discussed above.

In the process of the present invention, a pattern is realized on a release liner after metallization by "selective demetallization" of the liner. The patterned metallized layer can be realized in two ways:

a) Patterned protection of zones of metallized beads before a homogeneous etching treatment bath, as claimed in Claims 1 or 14;

b) Patterned etching via a screen-printing machine (as described in Examples 3 and 4 herein), as claimed in Claim 15.

In a later step, a binder layer is homogeneously applied throughout the width and length of the fabrics. Thus, in the coupling stage, the bead transfer is complete and the surface of the product is fully covered with beads, without bare fabric zones, having at the

same time the characteristics of a homogeneous/robust release liner product and a detailed retroreflective drawing suitable for high quality fashion uses.

In the caption a) scenario, the patterned protection is realized by partially covering the metallized layer with a thermoplastic printing design; the thermoplastic drawing layer, once heat-transferred over the metallized microspheres, offers selective protection to the etching bath; only beads not covered by the drawing are demetallized. This thermoplastic drawing is not a binder layer in a chemical sense or in a size sense. There are no issues regarding adhesion to the fabric, no structural/mechanical properties are necessary for this design layer, since the binder layer will be applied in any case in a following step. In particular, the thermoplastic layer can be very thin compared to the size of the beads (a few microns) and in any case, a leveling is obtained during the binder layer application. One of the consequences is that the final product has everywhere a constant thickness, irrespective of the metallized beads (isle) or the transparent bead (sea) regions.

In the caption b) scenario, the liner metallized surface exposed to the etching solution is not protected, but it is the way the etching solution flows through the rotary screen printing, thus being in contact with only a fraction of the metallized surface, that creates alternating regions of metallized /demetallized microspheres. The rotary screen-printing is used to create pattern-like flowing of the etching water solution (approx 1-5 $g/m^2$) on the metallized surface of the liner, and not to apply a permanent thick polymer-based binder layer on fabrics (usual order of magnitude 30-100 $g/m^2$).

The process in the present invention leads to a retroreflective product with a much more "sharp-edge", high-quality, retroreflective drawing.

Moreover, according to the present invention, since 100% protection of the surface is realized, the drawing appearance is independent of fabric properties, like fiber color, for example.

As discussed in greater detail below, none of the applied prior art discloses or suggests all the above steps. Indeed, by carrying out these steps, a product is obtained, as shown in Fig. 6 of the specification herein, and as discussed above.

Crandall discloses a retroflective article which includes retroflective elements, which may be transparent glass microspheres partially embedded in a polyether polyurethane binder, wherein the embedded portions of the microspheres may contain vacuum-deposited aluminum for specularly reflecting light. Crandall discloses further that in lieu of or in addition to the metal reflective layer, a dielectric mirror may be used as a specularly reflective layer, which dielectric mirror may comprise layers of alternating sequence of refractive indices (column 6, line 36ff). The retroflective article is then applied to a substrate.

While the Examiner finds that Crandall discloses printing a non-etchable pattern onto the aluminum layer, relying on the disclosure at column 6, lines 10-35, no such disclosure appears therein, or anywhere else in Crandall.

Newly-applied Olsen discloses a transfer sheet material for forming retroflective graphic images on a substrate wherein, in one embodiment as shown in Figs. 1 and 2, after microspheres are partially embedded in a heat-softenable layer of a carrier sheet, a colorant composition comprising a colorant in a transparent resin is printed in an image-wise pattern onto the microspheres in a first graphic segment, followed by printing in an image-wise pattern a reflective layer composition comprising reflective flakes in a transparent binder in a second graphic segment, wherein any overlapping areas are characterized by the color layer being disposed between the microspheres and the reflective layer composition, followed by printing onto the first and second graphic segments of the sheet material with a bonding composition to a depth sufficient to embed all exposed surfaces of the color layer and the reflective layer and drying the bonding composition to form a bonding layer and the completed sheet material, the bonding layer being adapted for use in subsequently adhesively

bonding the sheet material to a substrate (paragraph bridging columns 2 and 3). In another embodiment, a layer of specularly reflective metal may be interposed between the transparent microspheres and the adjacent bonding layer in any graphic segment designated to have a gray or silver color and a strong retroflective brightness (column 3, lines 32-38), which embodiment is illustrated in Fig. 4. The Examiner relies on this embodiment. The Examiner appears to particularly rely on that part of Fig. 4 showing graphic segments **45**, wherein the vapor-coated specularly reflective layer **46** is not further coated by the color layer or the reflective layer, but rather only bonding layer **53**. Olsen further discloses that a two-component extender resin can be screen printed in an imagewise pattern over the aluminum layer **46** in the graphic segments **45** and allowed to dry, followed by etching the unprotected metal areas with an etchant solution which is believed to contain, *inter alia*, sodium hydroxide (column 11, lines 8-33).

The Examiner holds that it would have been obvious to combine the binding and etching steps of Olsen with the method of making a retroflective article disclosed by Crandall.

In reply, even if Crandall and Olsen, together with the other applied prior art, were combined, the result would still not be the presently-claimed invention. In the present invention, the beads will have a specularly reflective mirror of aluminum in a pattern coated on a polyurethane resin, as well as two layers of dielectric mirror over both the printed aluminum part of the bead as well as the non-aluminum part thereof, referred to in the specification herein as having double mirror layers [0015]. Thus, even if the aluminum reflective layer in Crandall were subject to etching as disclosed by Olsen, the result would still not be the presently-claimed invention. While the Examiner relies on Pohto et al for a disclosure of applying a polyurethane resin spacing layer prior to depositing aluminum layers, Pohto et al discloses such a spacing layer as providing a desired focal length between

the beads and the reflective surface (column 1, lines 37-40). However, without the present disclosure as a guide, it is not seen why one skilled in the art would add this separate step in making Crandall's retroflective article, either *per se*, or as combined with remaining prior art.

New Claim 15 is separately patentable. Thus, in Olsen, screen printing is used in a 2-step process, i.e., to apply (patterned/shaped) regions (step 1) of binder resin (column 11, lines 14-18) on the carrier sheet bearing fully metallized beads with the function of protecting desired metallized bead regions before the immersion (step 2) in an etching solution (column 11, lines 21-24).

In Claim 15 herein, a screen printing machine is used to apply directly the etching solution in a pattern-like way on the fully metallized beads, so as to produce, in one shot, alternating regions of metallized/demetallized beads. In the present invention, it is an etching solution that flows through the particular arrangements of holes of the screen cylinder with the desired shape and not a viscous polymer (the binder) with a protective function as in Olsen. No protection with resin with a pattern-like shape needs to be realized.

Thus, Olsen requires the following four steps:

Step 1: protection with a polymer binder layer resin with areas shaped via screen printing;

Step 2: drying of the protective binder layer;

Step 3: immersion in an etching solution;

Step 4: drying of the etching solution.

The corresponding steps of the invention of Claim 15 are only two:

Step 1: etching solution flowing throughout a screen printing cylinder in a desired shape;

Step 2: drying of the shaped etching solution.

The structure of the respective product intermediates after "etching" is different since in Olsen all the metallized beads, which have been protected, have at this stage some polymer crust/residues (the binder protective layer itself) behind metallization, while in the present invention, metallized beads are still totally clean. Moreover, all boundaries between metallized/demetallized regions are sharper if a shaped etching solution flows through the screen cylinder than with a shaped protective binder layer.

Finally, none of the remaining prior art remedies the above-discussed deficiencies.

For all the above reasons, it is respectfully requested that the rejections over prior art be withdrawn.

The rejections of Claims 1-13 under 35 U.S.C. § 112, second paragraph, is respectfully traversed. The Examiner finds that the term "a minimum coefficient of retro-reflection ($cd/lx.m^2$) indicated by European Standard EN 471/1994 (related to high visibility warning clothing) and/or EN 13356/2001 (related to visibility accessories for non-professional use)" is unclear. The Examiner further finds that minimum values can change.

It is well-known that an Applicant may be his own lexicographer. See M.P.E.P. § 2111.01IV. Applicants define these minimum values in the specification, at paragraph [0010] i.e., 250 $cd/lx.m^2$, with entrance angle of 5°, observation angle 0.33°, class 2, for EN 471/1994 and 80 $cd/lx.m^2$, for an entrance angle of 5°, observation angle 0.33°, type 2 and 3.

Accordingly, it is respectfully requested that the rejection be withdrawn.

All of the presently-pending claims in this application are now believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

Respectfully submitted,

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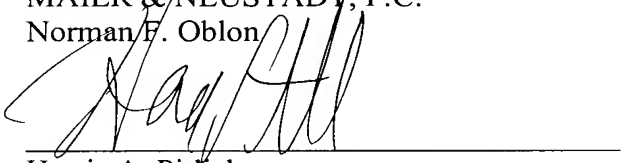

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